

# Unit Planning Guide: Grade 8 Unit 1 of 6

<b>Unit Title:</b> Linear Equations and Functions	<b>Pacing (Duration of Unit):</b> 14 weeks/1.5 Quarters
<b>Grade:</b> 8	<b>Buffer Day(s):</b> 5 days

## Desired Results

### Transfer Goals (Priority practice standards in **bold**)

*Students will be able to independently use their learning to:*

- MP.1. **Make sense of problems and persevere in solving them.**
- MP.2. Reason abstractly and quantitatively.
- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. **Model with mathematics.**
- MP.5. Use appropriate tools strategically.
- MP.6. **Attend to precision.**
- MP.7. **Look for and make use of structure.**
- MP.8. Look for and express regularity in repeated reasoning.

### Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

#### Prerequisite Standards:

- 6.NS.8: Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
- 7.RP.2: Recognize and represent proportional relationships between quantities.
  - 7.RP.2a: Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table, or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
  - 7.RP.2b: Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
  - 7.RP.2c: Represent proportional relationships by equations. *For example, if total cost  $t$  is proportional to the number  $n$  of items purchased at a constant price  $p$ , the relationship between the total cost and the number of items can be expressed as  $t = pn$ .*
  - 7.RP.2d: Explain what a point  $(x, y)$  on the graph of a proportional relationship means in terms of the situation, with special attention to the points  $(0, 0)$  and  $(1, r)$  where  $r$  is the unit rate.

#### WIDA for English Language Learners

Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting

Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**

In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.) appropriate language function expectations and scaffolds or supports.

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- 7.EE.1: Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.4a: Solve word problems leading to equations of the form  $px + q = r$  and  $p(x \div q) = r$ , where  $p$ ,  $q$ , and  $r$  are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

### Standards (Priority Standards in **bold**):

- 8.F.1: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- **8.F.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).**
- 8.EE.7: Solve linear equations in one variable.
  - 8.EE.7a: Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form  $x = a$ ,  $a = a$ , or  $a = b$  results (where  $a$  and  $b$  are different numbers).
  - **8.EE.7b: Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.**
- 8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two  $(x, y)$  values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
- 8.EE.6: Use similar triangles to explain why the slope  $m$  is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation  $y = mx$  for a line through the origin and the equation  $y = mx + b$  for a line intercepting the vertical axis at  $b$ .
- **8.EE.5:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
- **8.SP.3:** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
- **8.F.3:** Interpret the equation  $y = mx + b$  as defining a linear function whose graph is a straight line; give examples of functions that are not linear.
- **8.F.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

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- **8.SP.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- **8.SP.2:** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

### Meaning (\*Mostly assessed through Performance Tasks/Assessments)

#### Big Ideas:

- Functions model linear relationships between two quantities.
- Equations, tables, graphs and words all can represent linear relationships, and it is important to be able to translate between them.
- Proportions are a special kind of linear relationship.

**Essential Questions:** (Questions which frame ongoing and important inquiries about the big ideas. They are written for students and used in daily instruction to help engage students in meaningful thinking.)

- How are the different ways that we represent data related to each other and what can we learn by looking at this data in different ways?

### Acquisition (\*Mostly assessed through traditional summative assessments)

**Knowledge:** Key basic concepts, facts, and key terms (written in phrases) students should be able to recall independently.

#### *Students will know ...*

- That linear relationships between variables can be modeled graphically, verbally, using tables, and algebraically.
- That the equation  $y = mx + b$  represents a linear relationship/function, a straight line, where  $(x, y)$  represents any point on the line,  $m$  represents the slope of the line, and  $b$  represents the location of the  $y$ -intercept.

**Skills:** The discrete skills and process students should be able to use independently.

#### *Students will be skilled at:*

- Using properties of equality to solve equations for any variable
- Identifying slope and intercepts in a given linear model
- Translating between tables, graphs, words and equations to represent linear relationships/functions
- Applying knowledge of linear relationships/functions to model and solve real world problems

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- That slope of a linear function represents the constant rate of change.
- That the y-intercept of a linear function is the initial value and the constant.
- That a function is a rule that assigns to each input exactly one output.
- When a relationship is linear or non-linear.
- That straight lines are used to model relationships between two variables

### Key Academic Vocabulary:

- **Function**
- **Linear/nonlinear**
- **Bivariate**
- **Qualitatively**
- **Scatter Plot**
- **Outliers**
- **Association**
- **Line of best fit**

- Write an equation given the slope and y-intercept, given the slope and a point on the line, or given two points on the line.
- Identifying and combining like terms to simplify multi-step equations.
- Using the distributive property to solve linear equations and inequalities with rational numbers
- Giving examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions
- Interpreting unit rate as the slope of the graph
- Comparing two different proportional relationships represented in different ways
- Using the equation of a linear model to solve problems in the context of bivariate measurement data
- Using similar triangles to explain why the slope  $m$  is the same between any two distinct points on a non-vertical line in a coordinate plane
- Describing qualitatively the functional relationship between two quantities by analyzing a graph
- Constructing and interpreting scatter plots
- Describing clustering, outliers, positive or negative association, linear and non-linear association
- Fitting informally a line of best fit

### Resource Suggestions: